

**Proposal to Delist Chorro Creek for Metals  
from  
California's 303(d) List of Impaired Waters**

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## **1. Introduction**

Total Maximum Daily Loads (TMDLs) are required for waters listed as impaired pursuant to Section 303(d) of the Clean Water Act. The 303(d) list identifies water quality limited water bodies. A water quality limited segment is any known segment that does not meet applicable water quality objectives and/or is not expected to meet applicable water quality objectives, even after the application of technology-based effluent limitations or other Regional Board requirements. Chorro Creek was placed on California's 1998 303(d) list for metals and siltation. This document reviews the 303(d) listing of Chorro Creek for metals and proposes Chorro Creek for metals be removed from the 303(d) list of impaired waters. A separate document of a TMDL for siltation in Chorro Creek, Los Osos Creek, and the Morro Bay Estuary is in the public and administrative review process.

### **a. Physical Setting**

The Chorro Creek watershed (the Watershed) is located in San Luis Obispo County, approximately 225 miles south of San Francisco Bay. The Watershed covers approximately 27,520 acres or 42 square miles, and, together with the Los Osos Creek watershed (approximately 20,480 acres or 32 square miles) makes up the larger Morro Bay watershed (approximately 48,000 acres or 75 square miles). The Watershed runs generally east-west, and is bounded to the north by the Santa Lucia Mountains, part of the Coast Range, and to the south by the Morros, a series of exposed volcanic plugs. Chorro Creek originates in uplands of the Santa Lucia Mountains, approximately 2,700 feet above mean sea level and ten miles distant from its mouth on Morro Bay. Chorro Creek and its tributaries have steep gradients and deeply dissect the uplands. Morro Bay is a semi-enclosed estuary and Chorro Creek empties into a salt marsh wetland in the eastern portion of Morro Bay. Morro Bay in turn empties westward into the larger Estero Bay and the Pacific Ocean.

The upper reaches of Chorro creek, draining approximately 7 square miles above Chorro Reservoir, can be considered an important sub-area of the overall basin due to the concentration of past mining activities in these upper reaches. This document will focus primarily on these upper reaches due to concerns about the relationship between inactive metals mines and water quality objectives for metals.

The climate in the Watershed is mediterranean, with cool, wet winters and warm, dry summers. There is typically little or no precipitation during the period May – November. Based on a 30 year period from 1961 to 1990 the average annual rainfall in the nearby city of San Luis Obispo is 23.5 inches (Chamber of Commerce, San Luis Obispo).

**b. Beneficial uses**

The *Water Quality Control Plan, Central Coast Basin – Region 3* (the Basin Plan) identifies various beneficial uses for Chorro Creek (Regional Water Quality Control Board [RWQCB], 1994), as depicted in Table 1, below:

Table 1: Beneficial Uses for the Chorro Creek Watershed

Designated Beneficial Uses of the Chorro Creek Waterbody upstream of Chorro Reservoir
Municipal and Domestic Water Supply
Agricultural Supply
Ground Water Recharge
Water Contact Recreation
Non Contact Water Recreation
Cold Freshwater Habitat
Warm Freshwater Habitat
Preservation of Biological Habitats of Special Significance
Rare, Threatened or Endangered Species
Freshwater Replenishment
Commercial and Sport Fishing
Spawning, Reproduction , and/or Early Development

**c. Land uses**

Various land uses occur within the Watershed including:

- a water supply reservoir;
- cultivated agriculture, including portions of the California Polytechnic State University;
- uncultivated rangeland;
- various urban, commercial and residential uses associated with the City of Morro Bay and San Luis Obispo County;
- developed parkland (El Chorro Regional Park and Morro Bay State Park);
- the Cuesta Community College campus ;
- a military reservation (Camp San Luis Obispo);

- a correctional facility (California Men’s Colony) with a point-source wastewater discharge;
- National Forest lands; and
- inactive metals mines.

Land uses in the upper Chorro Creek area above Chorro Reservoir are comprised of only the inactive metals mines, National Forest lands, Camp San Luis Obispo, and uncultivated rangeland.

#### **d. Habitat and fisheries**

##### **Faunal Survey**

The California Army National Guard, Camp San Luis conducted an aquatic faunal survey in the upper reaches of Chorro Creek (two sample sites in the western fork and three sample sites in the middle fork above Chorro reservoir) from November 1992 through May 1994. The National Guard reports good diversity of fauna in the western fork (35 species of insects, red-legged frogs, and various other biota) and a more diverse assemblage in the middle fork (rainbow trout [presumed land-locked steelhead], 32 species of aquatic insects, coastal range newts, northwestern fence lizards, alderflies [Sialidae] and caddisflies [Rhyacophilidae] among other biota; Froland, 2000).

#### **e. Geology and mining**

The watershed occurs within the California Coast Ranges geologic province. The watershed’s southern boundary is the Morros, a series of exposed dacite volcanic plugs. The Santa Lucia Mountains form the watershed’s northern boundary, and include Franciscan Formation sedimentary rocks, and various igneous and metamorphic rock, including serpentine, peridotite, and dunite (Eckel, et. al., 1941). Lenses and pods of chromite ore occur in the dunite and, to a lesser extent, the peridotite (RWQCB, 1999). Chromite ore may also contain iron, magnesium, nickel, chromium, aluminum and oxygen, and is typically fine-grained, with grain diameters less than 1 millimeter (RWQCB, 1999). Chromite and other ores found in the watershed typically occur as metal oxides and do not tend to produce acids on contact with water.

The watershed contains a number of inactive mines, dating from the latter nineteenth century through the early 1970’s. Some mines experienced alternating phases of activity and inactivity, and some were partially converted from closed-shaft mines to open-pit mines. Little or no mine reclamation has occurred in the watershed, and mine sites may contain open pits, open shaft entrances, mining machinery, ore piles, and spoils piles. Metals-rich sediment is ubiquitous in the watershed, originating from the erosion of natural lithology and from commercial mining operations.

**f. Available Data**

Data available for this TMDL includes water and sediment sampling conducted as part of two studies in area performed by the Regional Board: Surface Water Degradation by Inactive Metal Mines in Northwest San Luis Obispo County, California (RWQCB, 1993), and Inactive Metal Mines in Four San Luis Obispo County Watersheds, Surface Water Quality Impacts and Remedial Options (RWQCB, 1999). Additional data on aquatic habitat is available from a faunal survey conducted by the California Army National Guard (Froland, 2000). Regional Board staff conclude that the most pertinent water quality data are found in Inactive Metal Mines in Four San Luis Obispo County Watersheds, Surface Water Quality Impacts and Remedial Options (RWQCB, 1999a). Regional Board staff note that none of the available data were from efforts designed specifically to collect data for the purpose of developing a TMDL or evaluating Chorro Creek related to Clean Water Act 303(d) listing criteria. The studies include limited analytical laboratory water quality data and were designed to characterize inactive mines not streamwater chemistry. A detailed discussion of the available data considered for this proposed delisting is included in Appendix A.

**2. Problem Statement**

The most current data available for Chorro Creek indicate that numeric water quality objectives for dissolved metals concentrations per the California Toxics Rule are being met. These data also indicate that numeric water quality objectives for total metals as expressed in the Basin Plan are being met in the waters of Chorro Creek. (Previous evaluations did note that some samples collected within mines exceeded objectives and thus displayed a potential future impact to the creek. However, no reliable samples collected from within the creek indicated exceedence of water quality objectives, see Appendix A.) The faunal survey conducted by the National Guard suggests narrative water quality objectives for aquatic habitat are being met in the waterways above Chorro reservoir. Because available data indicate both numeric and narrative objectives (of the Basin Plan and the California Toxics Rule) are being achieved in Chorro Creek, Chorro Creek is identified as having no metals-specific water quality impairment.

**a. Water Quality Objectives**

The Basin Plan contains both narrative and numeric water quality objectives for specific metals and beneficial uses. Water Quality Objectives in the Basin Plan are expressed as concentrations of total water column metals. In addition to the Basin Plan (for priority pollutants), the California Toxics Rule (Federal Register, 2000) provides water quality objectives pertinent to dissolved metals concentrations. Regional Board work files indicate Chorro Creek was placed on California's 303(d) list due to exceedences of Basin Plan metals objectives identified using a spreadsheet database. Clarification of sampling locations indicates that Basin Plan and California Toxics Rule water quality objectives for metals are being met within Chorro Creek.

### **3. Proposed Delisting**

#### **a. Delisting factors**

Regional Board staff considered delisting factors identified in the 1998 Clean Water Act Section 303(d) Listing Guidelines for California (Ad Hoc Workgroup, 1997) for adding or removing waterways from the 303(d) list. These guidelines were developed by a workgroup of regional board, state board, and US EPA Region 9 staff and indicate that water bodies may be delisted for specific pollutants or stressors if any one of six factors is met. These guidelines were considered by the Central Coast Regional Board, State Water Resources Control Board, and US EPA Region 9 during the public and administrative review and approval of the State's 303(d) List of Impaired Waters in 1998.

The six Delisting Factors were:

1. Objectives are revised, and the exceedence is thereby eliminated.
2. A beneficial use is de-designated after US EPA approval of a Use Attainability Analysis, and the non-support issue is thereby eliminated.
3. Faulty data led to the initial listing. Faulty data include, but are not limited to typographical errors, improper quality assurance/quality control (QA/QC) procedures, or Toxic Substances Monitoring/State Mussel Watch EDLs which are not confirmed by risk assessment for human consumption.
4. It has been documented that the objectives are being met and beneficial uses are not impaired based on "Monitored Assessment" criteria.
5. A TMDL has been approved by the US EPA.
6. There are control measures in place which will result in protection of beneficial uses. Control measures include permits, cleanup and abatement orders, and watershed management plans which are enforceable and include a time schedule.

Considering these Delisting Factors, Regional Board staff propose removing Chorro Creek from the 303(d) list for metals. This proposal is based on available data which indicate that delisting factors 3, 4, and 6 above have been met. Each of these factors are discussed below in relation to the available data regarding Chorro Creek.

#### **b. Delisting Rationale**

Factor 3.

Chorro Creek was initially placed on the 303(d) list based upon data collected during studies of inactive metals mines in the region. Although the data themselves are not faulty, the interpretation of the data was incorrectly performed. Staff entered the field sampling data from reports into a spreadsheet database for convenient access. In preliminary screening of database files in preparation for the 1998 303(d) list process, two sample locations were observed to routinely exceed numeric metals water quality objectives and Chorro Creek was therefore recommended for listing for metals. However, subsequent detailed examination of the data - which were collected to evaluate inactive mine sites - reveals that the two sample locations in question were not in the waterway (Chorro Creek). One was collected in the interior pit pool of an inactive mine and the

other was from a seepage face on the side of a tailings slope. Therefore, Regional Board staff believe this listing was faulty interpretation of field data which does not indicate metals impairment in the creek and is inconsistent with other sample results from the creek indicating no exceedence of water quality objectives.

#### Factor 4.

Subsequent to the 1998 placement of Chorro Creek on California's 303(d) list for metals impairment, Regional Board staff received a copy of the National Guard's 1992 - 1994 Faunal Survey for Camp San Luis Obispo (Froland, 2000). Data presented in this report indicate a broad variety of insects and aquatic species in the forks of the upper reaches of Chorro Creek above Chorro Reservoir. This new data suggests that aquatic habitat narrative objectives of the Basin Plan are being achieved. Although no new water quality data were available to confirm this, it is important to consider the value of the faunal data in the overall evaluation of conditions in Chorro Creek.

As an extra margin of safety, the relationship of habitat indicators to satisfactory water quality will also be confirmed with ongoing numeric data collection:

- in the ongoing Central Coast Ambient Monitoring Program (CCAMP),
- as part of a separate TMDL for metals in Morro Bay (currently being developed), and,
- in the monitoring and implementation phases of the siltation TMDL for Morro Bay and Chorro Creek (RWQCB, 2001).

The availability of aquatic habitat data not previously considered satisfies factor 4 of the delisting factors.

#### Factor 6.

A recently developed TMDL for Siltation for Chorro Creek, Los Osos Creek, and Morro Bay Estuary establishes a load reduction in sediment throughout the Morro Bay watershed (including Chorro Creek and its upper reaches above Chorro Reservoir) of approximately 50% (RWQCB, 2001). The Siltation TMDL implementation plan specifically requires remediation of inactive mines as progress toward achievement of the sediment reduction goals. In addition, the entire Camp San Luis Obispo, including its mines, has entered into a cost recovery agreement for Regional Board Staff oversight of actions to achieve the required reclamation of the mines (RWQCB, 1999b). The Siltation TMDL will be presented to the Regional Board for adoption in February 2002. The National Guard (Camp San Luis Obispo) has already begun work on one remedial effort ("Grand Canyon" project). The National Guard has indicated intent to budget sediment reduction remediation for the mines on National Guard property over the next several years.

As these sediment reduction projects progress, they are expected to reduce sediment influx into the Creek, which is expected to result in reduced metals loading into the waterway (based on the metals being adsorbed to sediment and only reaching Chorro Creek when sediment is transported into the waterway). The establishment of the siltation TMDL, with these actions to reduce sedimentation (and metals), is an enforceable action



with a specific timetable for implementation which satisfies Factor 6 of the delisting factors.

Because Chorro Creek's listing for metals impairment satisfies factors 3, 4, and 6 of the delisting factors presented in the 1998 Clean Water Act Section 303(d) Listing Guidelines for California (Ad Hoc Workgroup, 1997), staff recommends that Chorro Creek for Metals be removed from California's list of impaired waters.

#### **4. Public Participation Process**

This proposal to delist Chorro Creek for metals will be presented to the Central Coast Regional Board for approval in a public meeting. Board meeting agendas are publicly noticed in advance and include opportunity for public comment on all action items before the Board. Prior to presentation to the Regional Board, a preliminary draft of the proposal will be sent out to the Interested Parties List developed for the Chorro Creek, Los Osos Creek, and Morro Bay Estuary Siltation TMDL. The mailout will include a schedule indicating when the formal draft proposal for public comment is anticipated and that the proposed delisting is scheduled as part of the 303(d) list update scheduled for presentation to the Regional Board at its October 2001 meeting. In addition to the mailout of the draft proposal to delist, a public information meeting was scheduled with the National Estuary Program to present these findings and enhance stakeholder input to the process.

If the Regional Board approves the proposal, it will be submitted to the State Board staff for inclusion in the state's public process of updating California's 303(d) list in 2001. These overlapping regional and state efforts will afford ample opportunity for public input on the Regional Board staff proposal to remove Chorro Creek from California's 303(d) listing of metals-impaired waters.

#### **5. References Cited**

Ad Hoc Workgroup, 1997. 1998 Clean Water Act (CWA) Section 303(d) Listing Guidelines for California. Workgroup Summary Document published August 11, 1997. State Water Resources Control Board, Sacramento.

Eckel, E.B., Yates, R.G., and Granger, A.E., 1941. Quicksilver Deposits in San Luis Obispo County and southwestern Monterey County, California. US Dept. of Interior, Strategic Minerals Investigation Bulletin 922- R. US Government Printing Office, Washington, DC.

Froland, JoAnn, 2000. Written communication to Chris Adair, RWQCB, June 26, 2000 titled Aquatic Surveys at Camp San Luis Obispo. California Army National Guard. CAEV-CR, Camp Roberts.

Federal Register, May 2000. California Toxics Rule. 40 CFR Part 131, USEPA. Federal Register Thursday May 18, 2000, pages 31682 – 31719.

RWQCB, 1993. Regional Water Quality Control Board, Central Coast Region. Surface Water Degradation by Inactive Metal Mines in Northwest San Luis Obispo County, California. December 1993.

RWQCB, 1999a. Regional Water Quality Control Board, Central Coast Region. Inactive Metal Mines in Four San Luis Obispo County Watersheds, Surface Water Quality Impacts and Remedial Options. June 1999.

RWQCB, 1999b. Regional Water Quality Control Board, Central Coast Region. October 13, 1999 Letter to Colonel John H. Moorman referencing SLIC Agreement to Enter into a Cost Recovery Program.

RWQCB, 2001. Regional Water Quality Control Board, Central Coast Region. Siltation TMDL for Chorro Creek, Los Osos Creek, and the Morro Bay Estuary. Draft April 11, 2001.

Appendix References:

Field, L. Jay, MacDonald, Donald D., Norton, Susan B., Severn, Corinne G., and Ingersoll, Chris G., 1999. Evaluating Sediment Chemistry and Toxicity Data Using Logistic Regression Modeling. *Environmental Toxicology and Chemistry*, v.18, no. 6, p. 1311- 1322.

Kszos, Lynn Adams, Stewart, Arthur J., and Taylor, Paul A., 1992. An Evaluation of Nickel Toxicity to *Ceriodaphnia Dubia* and *Daphnia Magna* in a Contaminated Stream and in Laboratory Tests. *Environmental Toxicology and Chemistry*, v. 11, p. 1001- 1012.

Weston, Donald, 2001. A Meaningful Chemical Analysis for Assessing the Environmental Risk Posed by Contaminated Sediments. *Currents-A Newsletter of the UC Center for Water Resources*, v. 2, no. 1, Spring 2001, p. 6-7.

## Appendix A

### Review of Available Data

#### 1. Numeric Data

Two evaluations, published in 1993 and 1999 respectively, were conducted by staff at the Regional Board and reported impacts from abandoned mines in the Chorro Creek watershed. These reports were: Surface Water Degradation by Inactive Metal Mines in Northwest San Luis Obispo County, California, by Central Coast Regional Water Quality Control Board (RWQCB, 1993) and Inactive Metal Mines in Four San Luis Obispo County Watersheds: Surface Water Quality Impacts and Remedial Options, by Central Coast Regional Water Quality Control Board (RWQCB, 1999). Although the data were not collected for the purpose of developing a TMDL, they are the available analytical sample data available for evaluating Chorro Creek. Metals evaluated in the two reports are listed below:

1993: Antimony, Cadmium, Chromium(III), Chromium(VI), Copper, Iron, Lead, Mercury, Nickel, and Zinc

1999: Aluminum, Arsenic, Barium, Beryllium, Boron, Cobalt, Magnesium, Manganese, Molybdenum, Selenium, Silver, Thallium, and Vanadium and the 1993 constituents.

The first report (RWQCB, 1993) described 26 samples collected throughout the watershed below mined areas. Each sample was analyzed for dissolved metals in water, total metals in water, sediment quality and general chemistry (including hardness). The data indicated two exceedences of Basin Plan objectives for total water column chromium. One exceedence of California Toxics Rule objectives was found for the dissolved amounts of copper. However the total amount of copper in that same sample was reported as non-detect which indicates either a reversal of sample identifications or a lab or sampling error. It is presumed in this evaluation that the sample identifiers were reversed, thus meaning the dissolved amounts were non-detect and the total metals amount was 0.4 mg/l. Interpreting the copper detection as a total metals content means the data do not indicate a violation of California Toxics Rule objectives.

The follow-up report (RWQCB, 1999) reported on twelve additional samples collected for a follow-up study and analyzed both total metals in the water column and dissolved metals. The 1999 data include a result where aluminum exceeded the water column objectives at a relatively distant downstream site near San Luisito Creek. The downstream sample had a reported total aluminum at 1.4 mg/l (versus a Basin Plan objective for municipal supply of 1.0 mg/l) and did not detect any dissolved aluminum. A mine pit water sample collected at the same time had 1.3 mg/l total aluminum and two samples along the creek in between these points had relatively consistent total aluminum concentrations of 0.1 and 0.3 mg/l, suggesting the downstream sample may have been an anomaly caused by sampling or analysis error. Because there was only one sample exceeding the mine pit sample, the intervening samples were at lower concentrations, and the next sample just downstream was also a much lower concentration (0.1 mg/l), the 1.4 mg/l aluminum result is being considered an anomaly and is not considered an indication

of exceedence of water quality objectives. Also, because the sample with total aluminum content of 1.3 mg/l was collected from a mine drainage channel and not in the waterway itself, it is not considered an exceedence of water quality objectives.

Data from the same follow-up report (RWQCB, 1999) also indicated that a copper Basin Plan objective exceedence reported in the first report (RWQCB, 1993) was no longer occurring. This further supports the interpretation that the copper data was incorrectly reported in the first report.

## 2. Aquatic Toxicity Data

As part of the data presented in “Inactive Metal Mines in Four San Luis Obispo County Watersheds: Surface Water Quality Impacts and Remedial Options” (RWQCB, 1999), toxicity testing was conducted using elutriate from sediment samples collected in the west and east fork of Chorro Creek (RWQCB, 1999, pg. C-1 and Appendix D, Table 6). Toxicity testing of elutriate determines the survival rate of the test organism(s), but does not identify the specific cause of lower survival rates. Testing was done by collecting a sediment sample and centrifuging the sediment with a test water, then taking the test water from the centrifuge and culturing aquatic species in a tank with this water for 72 hours. The test reported (SWRCB, 1999) used ceriodaphnia dubia. Although widely used to evaluate aquatic toxicity, scientific literature indicates ceriodaphnia dubia is highly susceptible to nickel toxicity (as compared to fathead minnows, see Kszos, Stewart, and Taylor, 1992). It is noted that recent research suggests elutriate may overestimate toxicity and other more appropriate methods of evaluating sediment are being developed (for example, see Weston, 2001 and, Field et al., 1999). Because only one species (ceriodaphnia dubia) was used and results did not clearly indicate a source of toxicity, staff find that this one test alone is not adequate enough to indicate an exceedence of narrative aquatic habitat objectives.